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IT support for Communities of Practice in Organizational Settings

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Abstract

Communities of Practice (CoPs) are increasingly being seen as innovative and creative value adding entities in organisations. Their contributions in the sharing of perspectives and context, support of learning processes and creating a social and communal identity, yield invaluable knowledge exchanges. With the advent of internetworking, the boundaries of organisational settings are broadened. This is particularly significant to CoPs as they can continue their ways of working, work practices, social engagement and connectivity in these settings, harnessing Information Technology (IT). This paper reports on early findings from an ongoing investigation into ways in which IT can support practices and knowledge exchange processes of CoPs in organisational settings.

Keywords

Knowledge Management, Organisational Learning, Tacit and Explicit Knowledge

INTRODUCTION

There is widespread acknowledgement of the role of CoPs in organisations in terms of new innovations and product development as well as the capturing and spreading of ideas and know-how as means of achieving competitive advantage. The notion of CoPs is not new and there has been an increased volume of literature on this subject (Augier *et al*., 2001; Shani *et al*., 2000; Wenger, 1998; 2001). As such, CoPs are considered to be indispensable in modern knowledge intensive organisations in helping to drive strategy, start new lines of businesses, solve problems quickly, transfer best practices, developing professional skills and helping organisations to recruit and retain talent (Wenger and Snyder, 2000). As an organisational 'form' CoPs evolve over time as a community through the processes of mutual engagement, negotiation of a joint enterprise while also building a shared repertoire. These processes involve learning, but most important of all, the processes of participation, mutual engagement and negotiation foster an environment in which tacit and explicit knowledge is created and exchanged. CoPs therefore become crucial to organisations that recognise knowledge as a key asset (Wenger, 1998; 2001).

The rise of the digital economy and internetworking are dramatically changing the working patterns, behaviour, collaboration and interactions mechanisms of both individuals and groups that share mutual interest or work together (Castells, 1996; Lyytinen *et al*., 1998; Tapscott, 1996). The emergence of networking technologies and online interaction may greatly support the contribution and participation of CoP members by allowing them to operate in globally dispersed settings (Davenport, 2001; Kimble *et al*., 2000). At the same time, we suspect that communities of practice where members are co-located (i.e. work in proximity of each other) may derive benefit by drawing on IT support (and web-based technologies in particular) in their practices. Hence in this paper, we explore the following research question: What are some typical practices that members of CoPs engage in within organisational contexts, and how do CoPs draw on IT in these practices?

This paper is structured as follows: first the literature on CoPs is revisited and central themes that pertain to CoP practices, specifically of relevance to organisational contexts, are outlined. A pilot case study is then described that illustrates how some of these themes

manifest, and ways in which IT is drawn upon in CoPs. The findings from the case study are discussed, and the paper concludes with avenues for further research in this area.

COMMUNITIES OF PRACTICE

One definition for a Community of Practice is "… a flexible group of professionals, informally bound by common interests, who interact through interdependent tasks guided by a common purpose thereby embodying a store of common knowledge" (Jubert, cited in Davenport, 2001:1). CoPs are found within organisations, across business units, across institutional boundaries and across multiple organisations while their official relationships to organisations vary from being unrecognised, legitimised, supported, to institutionalised (Wenger, 2001). The common interests members share give reason to exchange ideas and experiences from diverse contexts. Unlike a formal group or team, a CoP links individuals that share the same passions and as such their innovative ideas drive strategy, generate new lines of business, solve problems, promote the spread of best practices, develop people's professional skills, and help organisations recruit and retain talent (Wenger and Snyder, 2001). Therefore, considering the diverse origins and multifaceted experiences contributed and shared by different members, the CoP members are actually continually engaged in learning processes driven by competence and experience (Lave and Wenger, 1991; Wenger, 1998).

Over time CoPs develop their own unique identity, which subtly shape their communication and negotiation mechanisms. This identity is reflected in the CoP's own sense of how it can communicate, mediate and share ideas, artefacts or procedures. The CoP gradually incorporates new members (and experiences), while at the same time building on its unique communal memory or repertoire. The shared context and diversity contributed by CoP members create a nurturing environment in which new ideas can be challenged, mediated or negotiated while the CoP also intuitively builds its own practices and experience framework (Augier et al., 2001).

The creation and sharing of knowledge is not limited to CoPs, and occurs naturally in many environments where workers and professionals engage in the solving of complex problems (Wenger and Snyder, 2000). A CoP is however regarded as a 'privileged locus' for the creation and sharing of knowledge (Wenger, 1998) since by definition it exhibits supportive conditions and a nurturing environment. In this respect, CoPs have been studied from a variety of perspectives, such as situated learning (e.g. Broendsted and Elkjaer, 2001), situated action or creative solving of local problems (e.g. Suchman, 1987), distributed cognition (e.g. Boland and Tenkasi, 1995); and the establishment of a social context for knowledge creation (e.g. Davenport, 2001). An exhaustive review of this literature is beyond the scope of this paper. Instead we condense a number of central themes from the literature that pertain specifically to how CoP practices manifest in organisational contexts, especially in terms of participation, collaboration and knowledge exchanges.

A common context: building, using and sharing a common context

Situated learning and situated action are only accomplished through the building, using and sharing of context. Brown and Duguid (1994) state that context underwrites interpretation and is an essential element of communication and a major source of simplicity. Each CoP develops during its life its own context, which is accomplished through processes of communication, engagement, negotiation, participation and reification. Reification is a process that gives form to people's experiences by treating abstractions as 'existing' or as a concrete object (Wenger, 1998; Lesser and Storck, 2001). These processes result in a communal memory or repertoire and a common language evolves such as terms, acronyms, subtleties and underlying assumptions unique to the CoP that are used in day-to-day interactions. Common context can also be extended to the use of shared narratives, stories, abstractions or symbols that serve as metaphors for personal experiences. People draw on the power of mental simulation, intuition, metaphors and storytelling to make new decisions, plans and ultimately to create and exchange knowledge (Klein, 2000).

The notion of multiple perspectives in a CoP: perspective making and perspective taking

The notion of perspective is of particular relevance in a CoP. During its life, CoPs develop their own unique social and cognitive repertoires or memories, which guide their interpretations of the world. The basis for transformations and negotiations within and between CoPs, are perspective making and perspective taking. Boland and Tenkasi (1995) describe perspective making as a process whereby 'communication of knowing' develops and strengthens its own knowledge domain and practices. As a perspective strengthens, it becomes more complex, but also more conducive to knowledge work.

Perspective taking on the other hand is a process where distinctive individual knowledge is exchanged, evaluated and integrated with that of others in the organisation. This process involves a number of inferential and judgemental processes. Knowledge held by individuals or groups must be represented, communicated, spoken or acted on in a community for others to incorporate in a perspective-taking process. Individuals or groups contribute multiple perspectives, which add to the richness of views in a community. The ability to make a strong perspective and capacity to take another perspective into account are central in building context and ultimately central in creating knowledge in organisations. Boland and Tenkasi (1995) further suggest that electronic communication should focus on narratives as a means of building strong perspectives within a CoP. Once reflected on and representing that perspective, boundary objects are created which in their turn allow for perspective taking in and between CoPs.

The intrinsic role of artefacts and boundary objects: borderline issues

Artefacts are physical objects that people create, use and modify in the course of doing their work or that helps them get their work done. Typical examples of such artefacts include documents, narratives, forms, and even computer-based systems. Wenger (1998) refers to artefacts as being part of the so called 'boundary objects' which include not also documents, but also objects such as terms, concepts and other forms of reification around which CoPs can organise their interconnections. Each artefact or boundary object has a specific structure, which conveys how it is made up, e.g. for a document it could be information presented by it which hints to its context, structure, parts of the object, annotations, presentation of the object (including colour, shape, layout, font, white space etc.), usage of the artefact, breakdowns and additional conceptual distinctions that matter in its creation and use (Beyer and Holtzblatt, 1998). There is a particular important interplay of material and social aspects of artefacts (Brown and Duguid, 1994). This interplay moves between the centre and periphery – depending on the practice and dynamics associated with a specific artefact – it can be central to one practice at a point in time or it may be peripheral to another practice at some other time. Those aspects of an artefact and its periphery that are available to each person involved in a particular interaction with it, is referred to as its 'border'. The notion of a 'border' is central to the relevance of artefacts in CoPs (Brown and Duguid, 1994). Artefacts can be remembered for its shape, form and structure and also its contents. Based on context, CoPs develop their own boundary objects or artefacts, often in a specific structure and style. This enables members to interpret and associate with the various types of boundary objects of their community.

Considering the notion of a border, artefacts serve as valuable association and representation mechanisms to create and/ or exchange knowledge in a CoP. People use metaphors and analogies to perform a variety of difficult tasks such as for example: understanding situations, generating predictions, solving problems and making plans. In the same way artefacts become boundary metaphors and analogies in CoPs that are shared and borrowed freely. These boundary objects serve to coordinate the perspectives of various constituencies for some specific purpose.

IT facilitation for CoPs

Most of the research on CoPs focus on aspects that relate to specific CoP practices and learning (Lave and Wenger, 1991; Wenger, 1998), ways in which they add value to organisations (Wenger and Snyder, 2000; Boland and Tenkasi, 1995; Cook and Brown, 1999); while recognising their importance in knowledge management processes (Davenport, 2001; Shani *et al*., 2000). However, not much is conveyed on IT facilitation for CoPs.

Historically much emphasis has been placed on vendors to provide solutions in the form of specific tools for group IT facilitation (Ciborra, 1996) while more recently, there seems to be an explosion of specific tools to support CoP collaboration and communication (e.g. Wenger, 2001a). As an example of typical support, Groupware products, such as Lotus Notes allow users to interact and share information that can be of a highly structured and unstructured nature. The adoption of new groupware technologies has changed the nature and dynamics of work in organisations dramatically. However, some groupware tools have been criticized for imposing too much rigour in their support for work practices. The use of networking technologies such as intranets, provides a networking environment with the additional ability to combine groupware functions and tools such as email, product development, chatting, virtual networking tools, frequently asked questions, database/ documents storage and retrieval, multimedia tools, searching tools (to name but a few). Previous studies have shown that web technologies in general are becoming significant for knowledge diffusion and communication in organisational contexts (Alavi and Leidner, 2001; Damsgaard and Scheepers, 2001). The web is an attractive conduit in this regard, since many organisations already have this technology embedded in their infrastructure.

In this paper, we investigate new opportunities and ways in which existing IT tools and infrastructures can support CoPs in their way of working and communicating. We concentrate on a typical example of a CoP where members draw on IT as a means to facilitate their work practices. We illustrate how the mentioned themes from the CoP literature manifest in this case.

CASE STUDY

The case describes the Online Teaching And Learning (OTAL) group, (academic staff and technical support staff) in the IT department of an Australian university. The group is responsible for various projects whereby online teaching and learning material is developed, evaluated and tested.

Data collection

The case study approach was the chosen research methodology for this investigation since it is especially appropriate in new topic areas (Eisenhardt, 1989) and allows for an in-depth description of the relationships in a particular situation (Galliers, 1991; Benbasat *et al.*, 1987).

The case concerns a small CoP that operates predominantly online, even though members of the CoP work in proximity of each other. A number of semi-structured interviews were held with some members to collect data about the ways in which the members collaborate, participate and communicate. Data collection occurred in April/ May 2002. Interviews were conducted with members of this CoP to gain insights into the ways in which web technology is employed in their practices and engagement. Data from the interviews were analysed by identifying specific themes derived from the CoP literature (Miles and Huberman, 1984), in particular practices in the CoP and associated information technologies the CoP drew on.

According to Wenger's definition, the OTAL group can be regarded as a CoP; Wenger's three basic criteria of a CoP (Lave and Wenger, 1991; Wenger, 1998; 2001) can be identified in the OTAL group's work practices:

- There is a sense of a joint enterprise in that all members work on a specific area of mutual interest towards the same goals – e.g. apart from normal teaching activities all members work and share interests in the same area namely development of course material for online learning. Some members work together in pairs on specific subject units while all members share mutual interests on online learning.
- The members function as a community – there is a sense of mutual engagement as they are all involved in the same processes and deliver similar products. They learn from each other as they interact. Their history of mutual engagement creates a forum to build the practice and the community – e.g. all members are engaged in the same processes, namely the design of lesson content to be delivered in an environment with the same look-and-feel. Members need to be

creative in their design approaches and learn from each other by sharing creative ideas. Design templates evolve to speed up the development process. New members learn from previous experiences of older members.

- They develop a shared repertoire in that templates evolve and become tools to complete and do work. They also share experiences and develop their own unique way of handling problems, solving problems and sharing best practices – e.g. experienced members share their templates and best practices with newcomers to simplify and shorten the development effort. Technical members get to know the needs of the academics and based on recurring questions and problems, develop templates and make them available. New problems are solved based on experience from previous problems.

The working practices they are engaged in revolve around the building of an online teaching and learning model to complement the existing face-to-face teaching model. Existing electronic slides serve as a basis from which online teaching material is developed. The CoP consists of all the academics involved in the design and development of the different online learning subjects and a few technical people that provide technical support for any aspects relating to the development process (e.g. converting material into the standard online look-and-feel, develop flash and audio inserts etc.). The CoP also includes peripheral members that occasionally 'drop in'. As such peripheral members find out what has been done thus far, what are the future developments, the look-and-feel of some of the developed modules, and to browse through developed material. This is done either to enhance their knowledge of a specific subject, or to evaluate existing course material they are familiar with. Peripheral members include previous and currently enrolled students. All current and peripheral members engage in the processes of perspective making and perspective taking to share and build context. Other interested parties in online teaching and learning occasionally take part in the viewing of material, discussion of artefacts, sharing of ideas etc.

This CoP has been in existence for about two years and almost all members know each other, i.e. they have either met before in the course of their normal work duties, or have met since the start of the various online projects. Initially, the CoP did not utilise information technology in their collaboration. Over the last year however, the community has doubled in members and started to draw on IT in their practices. This is also a result of the university's investment in a course delivery and management (CDM) tool.

The CDM is a web-based tool and learning environment, but for this CoP it also became a platform to support members' developmental work practices, collaboration and communication. However, members' did not solely use the CDM but also used other familiar tools such as email, and the departmental intranet facilities to find and post relevant documents. New members can access draft versions of completed online units via the CDM to work through in order to get a feeling of the look-and-feel of completed material and an idea of the progress being made.

Members communicate regularly using email while discussions take place using the CDM threaded discussion groups. When members are physically at work, they can easily communicate face-to-face about project related matters. However, some members do equally well using only email and threaded discussions. One CoP member commented: "…*I need not communicate with the others face-to-face; I like the idea of working where I want to work (in my office or at home) while having the ability to communicate using email and getting documents without having to see each other face-to-face… I actually prefer working from home on this…"*

Work products in the form of templates and artefacts are stored in a central directory on the server and technical members regularly upload new templates or any documents other members require from time to time for developmental work. Contributors upload finished work products or significant work practices they may find relevant to other members in the CoP. These serve as important sources for negotiation and comments of other CoP members. All new additions and contributions are communicated using the CDM or email while discussions on specific work artefacts may happen personally between members using email or more publicly using the discussion threads. One of the members commented that she can work "…. *without seeing the others… virtual works for me… I can do almost*

everything I can with IT". On the other hand, another member felt that there is nothing that replaces the face-to-face meeting: "…*I do not like the idea of discussing an issue with somebody virtually. I need that awareness, of seeing how people react with facial expressions on comments I make. I do not think that I would be able to work without meeting face-to-face."* However, on a further question whether awareness can be overcome when collaboration takes place with people he knows personally or has met before, the same person answered: *"…I suppose I can, it would make it easier because I would be able to 'read between the lines' when communicating via email."*

More experienced members share best practices in the form of text documents, which promotes the learning process of newcomers on the team. Peripheral members occasionally 'drop in' to find out what has been achieved or produced, and they communicate their views and perspectives on the work done using email or the discussion threads. Members find it easy to use IT to collaborate with respect to sharing. One member's comments in this regard are *"…email communication makes it easy to feed back issues on evaluation… where multiple perspectives are required, discussion lists support this…"*

Peripheral members such as subject evaluators occasionally access drafts that near completion to evaluate and 'discuss' content. Their discussions is either face-to-face, through email or discussion threads. One of the members commented on IT support for this as follows: "…*I find that the email communication gives me a little bit more time to reflect one feedback or the ideas and views of the other person. Also, reading things over and over makes it sink in – I can build a better idea of what the feedback is all about. And then the other thing, I have a history of what has been said and commented, the previous emails form part of this history and I can also go back to get a proof of things commented previously."* Newcomers or peripheral members can easily learn or get a better understanding or clarification of aspects commented on in the discussion threads. Therefore they serve as supportive mechanisms for the learning process. One member commented, *"…I like the discussions, often things I have wondered about myself, are answered there…"*

Due to hectic work schedules, CoP members are confined by time. This also means that they work at different times on the projects and can continue their work whenever they can. Some work from home on projects or at university when they are there. Surprisingly, the projects seem to progress, irrespective of members' working patterns and the lack of face-to-face interaction. The latter was planned to occur in a weekly meeting that was supposed to for members to negotiate matters that could not be resolved online and to comment on major or specific issues. Meeting attendance is not compulsory. In fact, interviewees stated that face-to-face meetings seemed to have lost their value, unless there are critical issues to be discussed.

Table 1 summarises the specific practices of this CoP that pertain to the central themes namely building of context, sharing of multiple perspectives and using boundary objects. The table also associates the IT drawn upon by this CoP in these practices.

CoP Theme	**Practices in the CoP**	**IT drawn upon by CoP**
Context – building, sharing and using context	'Dropping-in' of peripheral members to evaluate and browse draft study units	Open access to draft/ completed learning material using the Intranet
	Exchanging of design and development ideas between all members on an assumed context	Personal Emails & threaded discussions
	Discussions between members and other evaluators on contextual issues of study units	Emails for private feedback and discussion Threaded discussion forums
	Asking of contextual questions by participating and 'drop-in' members	FAQs and Email Threaded discussion boards
	Sharing of ideas, artefacts, templates, tips, best practices and pitfalls	Email attachments, open access to repository
	Networking with other CoPs on similar contextual issues	Online Discussion groups Using search engines to search for suitable links on specific topics

CoP Theme	Practices in the CoP	IT drawn upon by CoP
	Notification of new upload material, templates or important documents	Email, Announcements/ Bulletin board of CDM
	Notification of important events, dates or meetings	Online calendars, Email, Announcements facility of CDM
Multiple perspectives – sharing ideas and views	Different members all working on the same study unit or document	Open access to documents using the Intranet
	Communicating and exchanging of technical and contextual ideas	Email, Synchronous chat and Threaded discussions
	Communicating with experts inside or outside the CoP	Email, Search engines to find experts
Boundary objects – artefacts	Storing and accessing work products (study units), design templates, forms, flash demo's	Open access to boundary objects using the Intranet
	Establishing and evolving of design and development templates and standards	Categorisation of documents, searching documents
	Creating and exchanging of new ideas using artefacts	Open access the completed study units and flash demo's using the Intranet
	Notification of new boundary objects/ artefacts	Announcements/ bulletin board of CDM

Table 1: Practices and IT use in the OTAL CoP

DISCUSSION

Interestingly, the case shows that even though members may be working in close proximity, they would still draw on IT to collaborate, communicate and negotiate. In doing so, members can continue their work without the need to meet face-to-face. From Table 1 it is evident that they draw heavily on IT, but it should be noted that CoP members assume a pre-existing context. The latter makes it easier to use IT in the way they do, and the fact that they know each other is an important consideration in understanding these practices. The case illustrates that, provided there is an adequate social infrastructure to share, connect, communicate, engage and participate, CoPs can function virtually anywhere – there is no real difference whether people work dispersed, online or in close proximity as seen in this case study.

Another interesting aspect of this case is that members use IT tools that "work for them" – they are not bound to a specific tool or environment but use a combination of different IT tools from different vendors. Although the CDM provides an integrated email tool, members preferred using the Intranet email tool they are accustomed with to communicate and share electronically. The CoP members draw on tools that they are familiar with, that is available and that seems to work best for them in their practices. In this respect, IT facilitates the social processes by creating an extended space for the exchange of mental and material artefacts.

Notable also is that members felt that they could have fruitful discussions to exchange knowledge based on assumed or pre-existing context – i.e. the boundary objects, evolving communal memory and other evolving artefacts. Only one of the interviewees' felt that he couldn't base his collaboration and sharing only on the sharing of artefacts. He needed face-to-face interaction to observe people's reactions about his ideas through their facial expressions. Others felt that these face-to-face knowledge exchanges could be accomplished using even a rich medium such as electronic mail.

Despite the availability of other tools, email still takes on a central role in this CoP. All collaboration, sharing, exchanging of ideas, notification of important things etc., are accomplished via email. Email therefore not only serves as an essential tool in support of negotiation, collaboration and engagement, but it also adds a dimension of 'tolerance' in critical knowledge exchanges. People can reflect on what 'has been said' by reading and rereading comments, suggestions and interpretations and go back to things 'said before'. A

possible explanation here is that in using email, compared to other IT tools e.g. the CDM, communication can be targeted to specific members only when the communication is of a confidential nature.

Artefacts can become supportive objects for knowledge creation and exchanges, providing they are central to members that share critical context. However, these objects become core elements that stimulate further discussions and enable the sharing of perspectives. Eventually they evolve as metaphors and analogies that are freely shared and borrowed by CoP members.

The character of a CoP is greatly determined by the nature of its member participation and engagement. Any sharing, evolvement or usage of artefacts is not possible without a social infrastructure that is conducive first to communication and secondly to knowledge exchanges. Since the early days of computerisation, IT technologies have evolved to support this. Participation in organisational settings can be accomplished without having to meet face-to-face – regular emails, announcements, Usenet groups, threaded discussions and regular net meetings all offer the potential to support this. This finding is consistent with other research (e.g. Ngwenyama and Lee, 1997) that even a "lean" medium such as email is sufficient for the sharing of "rich" ideas. The manner in which this CoP draws on IT in their practices seems to rest on shared contextual assumptions and on the fact that members know each other well.

The sharing of artefacts is easily accomplished through access to a repository or shared area of the Intranet. A factor mentioned by interviewees is that they need to know about additions to the 'communal memory' to search and locate relevant artefacts. Members of the CoP remarked that they learn a lot through threaded 'discussions' in the CDM. This is one mechanism for supporting perspective making and perspective taking in the CoP (Boland and Tenkasi, 1995). Fresh new interpretations add to individual members' and the collective knowledge.

The case also illustrates that a CoP may draw on a collage of different artefacts and IT tools throughout its existence. Interviewees reported that over time, they realise what type of IT tools they prefer, and what not. CoP members keep each other informed about different ways of using artefacts and tools, and over time they shape their own environmental artefacts and tools to support their work practices and participation. Evolving artefacts are seen as useful metaphors, analogies and cues that can be drawn upon and related to new situations and work practices.

CONCLUSIONS

The findings of this ongoing research indicate that IT can indeed play a major role in supporting work practices of CoPs, even for CoPs that are physically co-located. In fact, as shown in the case, IT facilitation for CoP work practices not only augments, but can also replace the need for face-to-face collaboration. Working from home in this case does not hinder CoP practices and communication. CoP members preferred to combine heterogeneous IT tools that they are familiar with in their work practices.

Typical practices that CoPs engage in revolve around collaboration, participation, negotiation and sharing of ideas and artefacts. Suitable IT tools can support these practices. Email has become a prime collaboration and communication tool in CoP practice, reducing the need to meet and communicate face-to-face. The case however rests on the assumption that CoP members know each other and can share contextual assumptions. These conditions seem to allow CoP members to draw more heavily on IT to facilitate their practices. In this respect, CoP members build their own collective memory, unique vocabulary and shared context. Over time they employ IT tools in ways that suits them best. Members are not bound to specific tools or environments, but use a collage of IT tools as if they operate in dispersed settings.

The case study demonstrates that social networking in a CoP, which forms an integral part of knowledge creation and sharing processes, can be extended beyond face-to-face interaction to the virtual arena. This suggests that if CoPs are given adequate IT support, a conduit is created for the exchange of knowledge in a CoP.

The next stage of this research will investigate CoP practices and IT facilitation for CoPs that operate under different conditions (e.g. CoPs that are geographically dispersed). Another aspect to be investigated further is awareness – whether the notion of 'knowing each other' in a CoP influences the practices of the CoP. The role of boundary objects, metaphors and analogies for tacit knowledge exchanges in CoPs will also be explored further.

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